May 10, 1951
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Status Report

STUDIES OF MOTION SICKNESS, VESTIBULAR FUNCTION AND EFFECTS OF DRUGS

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Period of Report: This report covers the period, Nov. 21 - May 10, 1951

Contract: Additional funds have been supplied by ONR to expand research on side effects of drugs and on methods for evaluation of the psychological effects of drugs.

Personnel: Dr. G. T. Hauty and Dr. R. B. Brown, Research Associates; C. Johnson, R. L. Cramer, Marjy N. Ehmer, G. H. Crampton and Jean G. Schaefer, Research Assistants; and Gordon Gay, Instrument Maker, continue on the project. Dr. E. B. Hutchinson and W. B. Knowles, Research Associates, are new personnel but will be only temporarily on the project, to June 30, 1951. Personnel is now being recruited for the expanded drug work.

Current Research:

A. Vestibular function. Hauty has completed taking extensive additional data on the quantitative characteristics of the primary and of the secondary (inverse) ocular nystagmus as a function of acceleration and of speed of rotation, on the temporal and quantitative characteristics of the previously reported periodic variations in speed of the slow phase of ocular nystagmus (primary, secondary and spontaneous nystagmus) and on the quantitative relationships of the slow and fast phases of nystagmus.

Cramer is successfully taking records of the electrical activity of the vestibular nuclei of the cat during positional stimulation, and during linear and rotary accelerations in each of the major axes. His objective is to plot the medullary distribution of endings of each of the five receptors in the vestibule and to discover their action characteristics.

Ehmer attempted to record electrical activity of the cerebellum during vestibular stimulation but finally gave up because of technical difficulties (see below for present activities).

B. Motion sickness. Johnson et al are nearing completion of a multi-variable study of motion sickness in which the same experiment is being given five independent repetitions on five groups of 48 subjects each. Three experiments are complete and the fourth and fifth are nearing completion. Old findings on motion sickness are being confirmed, except for the previously reported small and unreliable difference showing an unfavorable effect of warm temperatures. It now appears that under our conditions (rather special

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with respect to temperature) there is no difference in sickness rates between 60°F and 100°F. Extensive data are accumulating (not yet analyzed) on the relationship of reported anxiety to incidence of sickness, of reported expectation of sickness to incidence of sickness, of magnitude and form of head movements to incidence of sickness (Crampton's work), and of the influence of sickness and other variables on mirror drawing performance. Each of these studies has some special theoretical interest.

A group of 13 graduate students did an experiment on 40 female subjects to look for relationships between susceptibility to motion sickness and performance on the Gottschaldt hidden figure test, and on the Witkin rod and frame test. No relationships were found in spite of apparently good theoretical reasons for expecting them. Other aspects of the data confirm the Wapner-Witkin studies except for better performance by our S's on the Gottschaldt test.

C. Drug studies. A major objective of the Johnson et al study (see above) was to find whether testing of the motion sickness preventive action of drugs is practical in the laboratory. Placebo, hyoscine, dramamine and histadyl were selected for this test. Analysis of the data of the first three experiments seems to indicate the following: (1) In a university setting such research is extremely expensive and time consuming and possibly not worth the total cost. (2) Such tests are probably useful only for screening purposes and not for quantitative comparisons of drugs, because the short exposure times used by us (20 minutes) appear to maximize differences between drugs rather than to give a true picture of efficacy to be expected under service conditions. (3) In well-controlled studies the minimum size of group necessary to screen a drug may be as low as twelve men if one uses a potent preventive such as hyoscine as a criterion. Successive experiments on hyoscine with groups of twelve men in each group (hyoscine and placebo) showed the following placebo-hyoscine ratios of amount of sickness: 42/0, 33/8, 42/0. (4) Under our conditions and dosages (histadyl, 25 mgm/100 lbs., dramamine, 50 mgm/100 lbs., hyoscine, 0.6 mgm/100 lbs.) our partial data indicate that histadyl has no superiority to placebo, dramamine reduces sickness to about half and hyoscine gives almost complete protection. These data should not be used to compare relative efficacy because of (a) considerations of equivalence of dosage and (b) the short exposure time to motion.

In the same study extensive data are being taken on psychological effects of the drugs and on their effects on performance. Most of these have not been analyzed. It may be noted, however, that in the first three experiments the hyoscine group showed a reliably smaller amount of reported anxiety before going on the vertical accelerator. The other drugs were without such effects. This finding seems to us to be especially significant from the point of view of methods in drug studies.

Hauty is just completing the gathering of data on a small study of the effects of dramamine and hyoscine on the vestibular system as indicated by output of eye movements during rotation. Preliminary analyses indicate that dramamine does not affect those parts of the vestibular system leading to the eyes, but that it greatly potentiates a competing system such as is present in sleep. No hyoscine data have been analyzed.

Ehmer is just beginning a major study of the effects of drugs on the vestibular system, as a Ph.D. thesis project.

Preliminary studies are underway on methods of recruiting, protecting and handling subjects in drug studies. Hutchinson is reviewing and reporting on relevant literature. Knowles is helping with equipment and design problems.

Travel and Conferences. Wendt visited research centers in the U.S.A. where studies of the psychological effects of drugs were in progress and laboratories in England where studies of motion sickness might be possible. It does not seem likely to him that there will be any sustained effort to do such research in England because there appear to be few or no research workers with an interest in this field. Liaison is being worked out with the numerous individuals and organizations in the U.S.A. interested in the behavioral effects of chemical substances.

Some present difficulties. Expansion of the drug studies has met very serious delays due to difficulties inherent in the regulations and procedures which govern administration of federal government contracts. In almost all areas of administration an investigator's aggressive efforts to get things done leave him with the feeling that he is punching pillows. Methods should be discovered for expediting projects in war-time and for saving the intellectual and emotional efforts of scientists for scientific work.

Approved For Release 2005/04/22 : CIA-RDP89B00552R000100030002-4